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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/566,652

06/28/2006

Tadaaki Kaneko

285507US0PCT

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02/18/2011

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EXAMINER

LANGMAN, JONATHAN C

ART UNIT

PAPER NUMBER

1784

NOTIFICATION DATE

DELIVERY MODE

02/18/2011

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/566,652	<b>Applicant(s)</b> KANEKO ET AL.	
	<b>Examiner</b> JONATHAN C. LANGMAN	<b>Art Unit</b> 1784	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11, 12 and 18-20 is/are allowed.
- 6) ☒ Claim(s) 8-10, 13-17 and 21-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/8/2010</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 18, 2011 has been entered.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8-10, 13-17, and 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, rejected under 35 U.S.C. 103 (a) as being unpatentable over Douglass et al. (US 3,163,563).

In regards to claim 8, Douglass et al. teach an article that comprises tantalum or tantalum alloys. The article is molded to a desired shape and then carburized by known methods to provide a carbide layer of the desired thickness. The carburization takes place in a carbon crucible and in a methane atmosphere (col. 3, lines 1-20).

Art Unit: 1784

The applicant claims the article in a product by process form, wherein the process limitations include a vacuum heat treatment under a condition where a native oxide layer of Ta<sub>2</sub>O<sub>5</sub> formed on a surface of the tantalum or tantalum alloy is sublimated to remove the Ta<sub>2</sub>O<sub>5</sub>; as well as heat treating the tantalum or tantalum alloy by introducing a carbon source into the vacuum heat treatment furnace to have carbon penetrate from the surface of the tantalum or tantalum alloy; wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

#### Ta<sub>2</sub>O<sub>5</sub> Removal

Douglass et al. are silent to removing the native oxide layer of Ta<sub>2</sub>O<sub>5</sub> through sublimation.

However the examiner takes two separate positions in regards to this claim limitation in view of Douglass et al.

The first position is that the processing conditions of a vacuum heat treatment and a heat treatment while introducing a carbon source as claimed, are substantially similar processing conditions to those disclosed by Douglass et al. Even though Douglass et al. do not mention the instantly claimed removal of native oxide Ta<sub>2</sub>O<sub>5</sub>, it is inherent that this would occur in Douglass et al. It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a prima facie case of either

Art Unit: 1784

anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada*, 15 USPQ2d 1655, 1658 ( Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Douglass et al. teach elevated temperature heat treatments of 2300°C (Table 1) in the presence of methane and a carbon crucible in a reduced atmospheric pressure (vacuum). These processing parameters substantially overlap those process parameters instantly claimed as well as taught (instant specification page 10, lines 20-25) and therefore it is inherent that the native oxide, Ta<sub>2</sub>O<sub>5</sub>, is removed.

The second position is that these parameters of a heat treatment to remove a native oxide, as well as a heat treatment in a vacuum in the presence of a carbon source are all product by process limitations that do not structurally distinguish themselves, from the prior art.

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.”, (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art,

Art Unit: 1784

although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

The instant claims set forth a product with a final structure that comprises a tantalum carbide layer on a tantalum body with no intervening oxide. Douglass et al. do not teach an oxide layer is present. As seen in the figures there is an interface with no intervening layers between the carburized tantalum body and the tantalum carbide layers. Therefore it is the Examiner's position that the structure of Douglass et al. is the same as the structure instantly claimed, wherein little to no patentable weight is given to the product by process limitations instantly claimed.

#### Fibrous crystals

Douglass et al. are silent to the tantalum carbide material comprising a TaC layer formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

However, as mentioned above, the tantalum or tantalum alloy of Douglass is carburized under similar conditions to those instantly claimed and taught, and therefore it is inherent that the tantalum carbide material comprising a TaC layer will have carbon

Art Unit: 1784

penetrate the surface of the tantalum or tantalum alloy, and the TaC layer will inherently comprise fibrous crystals within the same TaC layer having the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

Regarding claims 9 and 14, Douglass et al. teach that the Tantalum is fully carburized (Table 2, material 6), thus teaching the penetration of carbon into all areas of the tantalum or tantalum alloy.

Regarding claims 10 and 22, as seen in Figure 2, the carburization results in a first layer of Ta<sub>2</sub>C and a second uppermost layer of TaC (see figure 2 and col. 2, lines 28-40). This multilayer structure reads on the claimed structure.

Regarding claim 13, the claims set forth that the tantalum carbide material is an electrode. While there is no disclosure that the article of Douglass is an “electrode” as presently claimed, applicants attention is drawn to MPEP 2111.02 which states that “if the body of a claim fully and intrinsically sets forth all the limitations of the claimed invention, and the preamble merely states, for example, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significance to claim construction”. Further, MPEP 2111.02 states that statements in the preamble reciting the purpose or intended use of the claimed invention must be evaluated to determine whether the purpose or intended use results in a structural difference between the claimed invention and the prior art. Only if such structural difference exists, does the recitation serve to limit the claim. If the prior art structure is capable of

Art Unit: 1784

performing the intended use, then it meets the claim. Since the material of Douglass et al. has the same structure as instantly claimed, it is not said to provide a structural distinction between the claimed invention and the prior art. The material of Douglass et al. is capable of serving as a free standing electrode, in that an electrode is a conductor, and since the material of Douglass et al. is the same as claimed it is said to also be able to serve the function of a conductor.

Regarding claim 15, the applicant sets forth that the electrode of tantalum carbide is a filament of the tantalum carbide or a heater of the tantalum carbide. These recitations are merely intended use and do not impart any structural limitations to the claims.

The recitation in the claims that the electrode is “a filament” or “a heater” is merely an intended use. Applicants attention is drawn to MPEP 2111.02 which states that intended use statements must be evaluated to determine whether the intended use results in a structural difference between the claimed invention and the prior art. Only if such structural difference exists, does the recitation serve to limit the claim. If the prior art structure is capable of performing the intended use, then it meets the claim.

It is the examiner's position that the intended use recited in the present claims does not result in a structural difference between the presently claimed invention and the prior art and further that the prior art structure is capable of performing the intended use. Given that Douglass et al. disclose the same coated material as presently claimed, it is clear that the article of Douglass et al. would be capable of performing the intended



Art Unit: 1784

use, i.e. being a filament or a heater, presently claimed as required in the above cited portion of the MPEP.

Regarding claims 16 and 21, Douglass et al. teach elevated temperature heat treatments of 2300°C (Table 1) in the presence of methane and a carbon crucible in a reduced atmospheric pressure (vacuum). Although this temperature range is just outside the claimed range of less than 2300°C, these product by process limitations are given little patentable weight as the applicant discloses that the claimed structural features are obtained for heat treatments of 1860°C to 2500°C (instant specification, page 10, lines 20-25). Since Douglass teaches, as described above, a heat treatment at 2300°C it is inherent that they will have the same structural features, and therefore little patentable weight is given to the claimed product by process limitations, as they do not provide a structural distinction between the article claimed and that of the prior art.

Regarding claims 17 and 23 as seen in Figure 2, the TaC layer is thicker than the Ta<sub>2</sub>C layer.

Claims 8-10, 13-16, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, rejected under 35 U.S.C. 103 (a) as being unpatentable over Lopez et al. (US 5,916,377).

In regards to claim 8, Lopez et al. teach an article that comprises carburized tantalum or tantalum alloys (col. 3, lines 50-55). The carburization occurs under a vacuum wherein the furnace was evacuated and flushed with argon gas for 3 cycles in

Art Unit: 1784

order to remove oxygen from the furnace. The carburization occurs at a temperature of 1700°C for about 10 hours (col. 4, lines 5-15). The carbon source in the vacuum is provided from a packed carbon powder.

The applicant claims the article in a product by process form, wherein the process limitations include a vacuum heat treatment under a condition where a native oxide layer of Ta<sub>2</sub>O<sub>5</sub> formed on a surface of the tantalum or tantalum alloy is sublimated to remove the Ta<sub>2</sub>O<sub>5</sub>; as well as heat treating the tantalum or tantalum alloy by introducing a carbon source into the vacuum heat treatment furnace to have carbon penetrate from the surface of the tantalum or tantalum alloy.

#### Ta<sub>2</sub>O<sub>5</sub> Removal

Lopez et al. are silent to removing the native oxide layer of Ta<sub>2</sub>O<sub>5</sub> through sublimation.

However the examiner takes two separate positions in regards to this claim limitation in view of Lopez et al.

The first position is that the processing conditions of a vacuum heat treatment to remove oxygen and a heat treatment while introducing a carbon source, are similar processing conditions to those disclosed by Lopez et al. as mentioned above. Even though Lopez et al. are silent to the instantly claimed removal of native oxide Ta<sub>2</sub>O<sub>5</sub>, it is inherent that this removal would occur in Lopez et al. since they teach substantially the same processing techniques, as well as the evacuation of all oxygen from the furnace.

It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially

Art Unit: 1784

identical processes, a *prima facie* case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada*, 15 USPQ2d 1655, 1658 ( Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Lopez et al. teach elevated temperature heat treatments of 1700°C for 10 hours in the presence of a carbon source in a reduced atmospheric pressure (vacuum), as well as the evacuation of all oxides. These processing parameters substantially overlap those process parameters instantly claimed and therefore it is inherent that the native oxide, Ta<sub>2</sub>O<sub>5</sub>, is removed.

The second position is that these parameters of a heat treatment to remove a native oxide, as well as a heat treatment in a vacuum in the presence of a carbon source are all product by process limitations that do not structurally distinguish themselves, from the prior art.

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.”, (*In re Thorpe*, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art,

Art Unit: 1784

although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

The instant claims set forth a product with a final structure that comprises a tantalum carbide layer on a tantalum body with no intervening oxide. Lopez et al. do not teach an oxide layer is present and as seen in the figures there is a sharp interface between the carburized tantalum body and the tantalum carbide layers. Therefore it is the Examiner's position that the structure of Lopez et al. is the same as the structure instantly claimed, wherein little to no patentable weight is given to the product by process limitations instantly claimed.

#### Fibrous Crystals

Lopez et al. are silent to the tantalum carbide material comprising a TaC layer formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

However, Lopez et al. teach a heat treatment at 1700°C under vacuum of 1.3 Pa for 10 hours. Applicant teaches a heat treatment of 1800-2300°C under vacuum of less than 1 Pa for 3 hours (instant specification, page 21). These processing parameters are

Art Unit: 1784

substantially the same, as it is known in the art that heat treatments of lower temperatures but longer time periods will achieve similar results to heat treatments of higher temperatures and shorter time periods. Due to these similar processing conditions and similar materials, it is the examiners position that the prior art material will exhibit the same characteristics as instantly claimed. Therefore it is inherent that the tantalum carbide material comprising a TaC layer formed by having the carbon penetrate the surface of the tantalum or tantalum alloy, wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

Regarding claims 9 and 14, the article of Lopez et al. teach that carbon penetrates the grains of the tantalum material, see Figures 1a, 1b, 2a, and 2b, thus teaching that carbon is penetrated into all areas of the tantalum or tantalum alloy.

Regarding claims 10 and 22, the carburization results in a first layer of Ta<sub>2</sub>C and a second uppermost layer of TaC (col. 4, lines 20-27). This multilayer structure reads on the instant structure of claim 10.

Regarding claim 13, the claims set forth that the tantalum carbide material is an electrode. While there is no disclosure that the article of Lopez is an "electrode" as presently claimed, applicants attention is drawn to MPEP 2111.02 which states that "if the body of a claim fully and intrinsically sets forth all the limitations of the claimed invention, and the preamble merely states, for example, the purpose or intended use of

Art Unit: 1784

the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significance to claim construction". Further, MPEP 2111.02 states that statements in the preamble reciting the purpose or intended use of the claimed invention must be evaluated to determine whether the purpose or intended use results in a structural difference between the claimed invention and the prior art. Only if such structural difference exists, does the recitation serve to limit the claim. If the prior art structure is capable of performing the intended use, then it meets the claim. Since the material of Lopez et al. has the same structure as instantly claimed, it is not said to provide a structural distinction between the claimed invention and the prior art. The material of Lopez et al. is capable of serving as a free standing electrode, in that an electrode is a conductor, and since the material of Lopez et al. is the same as claimed it is said to also be able to serve the function of a conductor.

Regarding claim 15, the applicant sets forth that the electrode of tantalum carbide is a filament of the tantalum carbide or a heater of the tantalum carbide. These recitations are merely intended use and do not impart any structural limitations to the claims.

The recitation in the claims that the electrode is "a filament" or "a heater" is merely an intended use. Applicants attention is drawn to MPEP 2111.02 which states that intended use statements must be evaluated to determine whether the intended use results in a structural difference between the claimed invention and the prior art. Only if

Art Unit: 1784

such structural difference exists, does the recitation serve to limit the claim. If the prior art structure is capable of performing the intended use, then it meets the claim.

It is the examiner's position that the intended use recited in the present claims does not result in a structural difference between the presently claimed invention and the prior art and further that the prior art structure is capable of performing the intended use. Given that Lopez et al. disclose the same coated material as presently claimed, it is clear that the article of Lopez et al. would be capable of performing the intended use, i.e. being a filament or a heater, presently claimed as required in the above cited portion of the MPEP.

Regarding claims 16 and 21, Lopez et al. teach elevated temperature heat treatments of 1700°C (Table 1) in the presence of a carbon source in a reduced atmospheric pressure (vacuum). Although this temperature range is just outside the claimed range of greater than 1860°C, Lopez teaches longer heat treatments, and therefore the final structure of Lopez will inherently have the same characteristics as instantly claimed little patentable weight is given to the product by process limitations of claims 16 and 21 as for reasons mentioned above, they are not said to provide a structural distinction between the claimed article and that article of the prior art.

Claims 8, 9, 13-16 and 21 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Garg et al. (US 5,126,206).

Art Unit: 1784

Garg et al. teach a tantalum electrode, which is a filament that is carburized through a process that involves a two step heat treatment as instantly claimed. The first heating step includes a heat treatment in a vacuum at 1800 °C. The second heat treatment involves a temperature of 2100°C for 12 hours, in the presence of a carbon source (CH<sub>4</sub>) (col. 10, lines 44-65).

Garg et al. are silent to the removal of Ta<sub>2</sub>O<sub>5</sub> during the first heat treatment. However, it has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a *prima facie* case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada*, 15 USPQ2d 1655, 1658 ( Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Since this heat treatment taught by Garg is similar to the heat treatment instantly claimed, it is inherent that the tantalum filament will behave in the same manner as instantly claimed, i.e. Ta<sub>2</sub>O<sub>5</sub> will be removed from the surface of the Ta filament, and furthermore it is inherent that the entire Ta filament in all areas will be penetrated with carbon.

A second position in view of Garg, is that these instantly claimed parameters of a heat treatment to remove a native oxide, as well as a heat treatment in a vacuum in the



Art Unit: 1784

presence of a carbon source are all product by process limitations that do not structurally distinguish themselves, from the prior art.

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.”, (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

The instant claims set forth a product with a final structure that comprises a tantalum carbide layer on a tantalum body with no intervening oxide. Garg et al. do not teach an oxide layer is present and teach that the surface is carburized well. Therefore it is the Examiner’s position that the structure of Garg et al. is the same as the structure instantly claimed, wherein little to no patentable weight is given to the product by process limitations instantly claimed.

#### Fibrous Crystals

Garg et al. are silent to the tantalum carbide material comprising a TaC layer formed by having the carbon penetrate the surface of the tantalum or tantalum alloy;

Art Unit: 1784

wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

However, as mentioned above, the tantalum or tantalum alloy of Garg is carburized under similar conditions to those instantly claimed and taught, and therefore it is inherent that the tantalum carbide material comprising a TaC layer formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

Regarding claims 16 and 21, the heat treatment of 2100°C falls within the claimed range of 1860°C to 2300°C. Although Garg et al. teach a pressure of 30 torr which is outside the claimed range of less than 1 Pa this limitation is a product by process limitation that is given little patentable weight. Garg teaches similar elevated heat treatments of the same materials claimed, and therefore the carburized tantalum filament will for reasons mentioned above have the same structure as claimed, and therefore little to no patentable weight is given to the product by process limitations. It is the examiner's position that the difference in pressures will not result in a structural difference between the claimed product and that product of the prior art.

***Allowable Subject Matter***

Claims 11, 12, and 18-20 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Lopez et al. and Douglass et al., teaches tantalum carbide crucibles. The prior art of record Garg et al. teaches freestanding filaments. There is no teaching or motivation to form those tantalum carbide materials as a patterned layer on a semiconductor substrate.

***Response to Arguments***

On page 8 of the remarks submitted December 16, 2010, applicant argues that “none of the references (Douglass, Lopez, or Garg) disclose a tantalum carbide material wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer as in amended Claims 8, 11 and 13.”

Applicant argues that “none of the reference disclose a tantalum carbide material obtained by a process where a native oxide layer of Ta<sub>2</sub>O<sub>5</sub> formed on a surface of the tantalum or tantalum alloy is sublimated to remove the Ta<sub>2</sub>O<sub>5</sub> as in as in amended Claims 8, 11 and 13”.

Applicant submitted a declaration to show that if Ta<sub>2</sub>O<sub>5</sub> is not sufficiently removed prior to depositing that TaC layers as in amended claims 8, 11, and 13, that the tantalum carbide does not necessarily and inherently result in the claimed fibrous crystals within the same TaC layer having the same growing direction; and a growing direction of fibrous crystals within a TaC layer being different from that of fibrous crystals within a different TaC layer.

However it was and still is the examiners position that the removal of the Ta<sub>2</sub>O<sub>5</sub> layer is inherent to the process steps disclosed by Douglass, Lopez and Garg. Lopez specifically teaches substantially similar processes where the pressure is 13.3 to 1.3 Pa (applicant discloses a vacuum environment of 1 Pa or less). Furthermore, Lopez discloses that prior to the carburization treatment the furnace is evacuated and flushed with argon gas for 3 cycles in order to remove oxygen from the furnace (col. 4, lines 10-13). Since Lopez et al. teach similar processes of using reduced pressure atmospheres prior to carburization, as well as teaches that oxygen is removed from the furnace, that there is inherently and necessarily no oxide layer on the surface of the tantalum of Lopez et al.

Although Douglass et al. teach that the pressure is much greater i.e. 2.6-6.6KPa, and Garg et al. teach that the pressure is 3.9 kPa, applicant is not claiming a method of making a product. Applicant's claims are drawn to a product in product by process form. It is the examiner's position that the reduced pressure systems of Garg and Douglass et al. will result in the removal of the Ta<sub>2</sub>O<sub>5</sub> layer prior to carburization. As it would be expected by one of routine skill in the art that as the pressure within the

Art Unit: 1784

furnace is increased, kinetics at the surface of the tantalum or tantalum alloy surface would similarly be increased and therefore result in a quicker removal of the Ta<sub>2</sub>O<sub>5</sub> layer. Applicant has not shown evidence that the surface of Garg and Douglass under their process conditions will have a Ta<sub>2</sub>O<sub>5</sub> layer, and therefore the declaration submitted 12/16/2010 is not found persuasive, and the rejections are maintained.

Applicant has failed to show that Douglass, Lopez, and Garg necessarily have a Ta<sub>2</sub>O<sub>5</sub> layer prior to carburizing. The prior art references are silent to a Ta<sub>2</sub>O<sub>5</sub> layer on their surfaces, and therefore it is the examiners position that there is no Ta<sub>2</sub>O<sub>5</sub> layer thereon.

Since for reasons mentioned above, there is no Ta<sub>2</sub>O<sub>5</sub> layer on the surface prior to carburizing the tantalum or tantalum alloy surfaces of the references Garg, Lopez et al., and Douglass et al., and since the prior art references disclose similar carburization temperatures and processing conditions as described above, it is the examiners position that the tantalum carbide material of the prior art of record will inherently comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.

### ***Conclusion***

Art Unit: 1784

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN C. LANGMAN whose telephone number is (571)272-4811. The examiner can normally be reached on Mon-Thurs 8:00 am - 6:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on 571-272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCL  
/Jonathan C Langman/  
Examiner, Art Unit 1784